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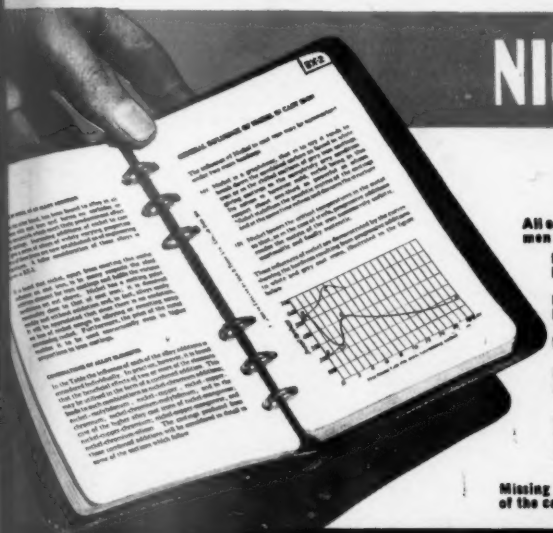
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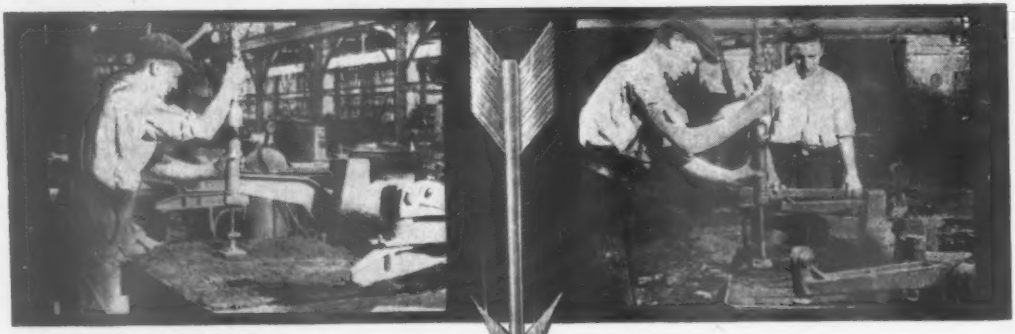

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FOUNDRY TRADE JOURNAL
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Vol. 69 Thursday, February 4, 1943 No. 1381

A Difficult Period

Few people are better placed than Major Richard Miles, the President of the Institute of British Foundrymen, to appreciate the difficulties which will overtake industry in the immediate post-war era. He has recently expressed his views in a letter to "The Times," in which he refers to the "break clause" which normally ensures the continuance of war contracts for three months. Our President estimates that this will cost £10,000,000 a day, but this expenditure will not entirely solve the problem, as three months is for many concerns too short a period to convert the factories from armament manufacture to plough-share production. He makes a plea that as many as possible should plan now in order to satisfy peacetime requirements in order to minimise the transition period. He cites the fairly obvious case of rolling stock replacement and urges that orders should be placed now, for manufacturing immediately the last all-clear has sounded. Intelligently conducted, many firms could bank on having a year's production on their books. Major Miles points out that he is well aware that there still remains the problem of the demobilised fighting men and speciality factories created for the needs of winning the war. In the latter category come the Government arsenals and shadow factories, which are stated to employ 300,000 people, of which 60 per cent. are women, and only 7.5 per cent. are skilled men. This letter of Major Miles is of paramount importance to the foundry industry, for its very structure can be as seriously impaired by an absence of post-war planning as it was by its conversion to a war industry. It is perfectly obvious that there will be a very great demand for builders' castings, yet a haphazard rush by everybody to supply the obvious requirements would only result in later trouble. Again, an attempt to maintain all the existing steelfoundries in continuous production after the war would be to place this section of the industry in Carey Street. A statistical examination of pre- and post-war capacities, together with actual and potential consumption would reveal too large a gap to be economical, and a planned capacity figure would help to bring about a sane outlook on the subject. Some newly established steelfoundries in iron-moulding shops, financed by the Government, could revert to their accustomed activities after the war. The great motor-vehicle concerns will need to study very carefully the Government's post-war policy in every aspect in order to determine a balanced manufacturing programme, for it is not at all sure that the new standard of living will give a pleasure car to everyone. All cars were not laid up after the outbreak of war as a result of petrol restrictions, but because of income-tax demands. After the last war there was a rush by the masses to use the motor coach excursions to holiday resorts, and a similar demand is a pretty safe bet, so that orders for these could be assembled now and their production planned. If a survey could be had of the probable plant replacements of the oilfields, rubber plantations and the like from Burma and tentative orders placed, such a step would be of invaluable help to the harassed works manager, thinking as to how he is to tide over this interim period. We feel sure some of the returned consuls and other officials could give a useful approximation of such needs. The textile and shoe machinery manufacturers could also help by the placing of tentative orders, as they must be aware of what home-market pressure is likely to fall on them immediately trading becomes free. It is obvious that the more work done in this direction, the easier will be the task of the Ministry of Labour and National Service, and the sooner will industry be in a position usefully to employ the returning men of the Fighting Forces. Major Miles has, indeed, done a useful service in pointing the way to easing what is admittedly going to be a difficult period.

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CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CORE LOCATION

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—The methods of core location in a deep bedplate illustrated by "W. G." in your issue of December 3 and the alternative by T. Smith, January 28, are both expensive and likely to cause scrap due to sand and dirt in the setting of such large cores or misplaced cores. It is my opinion that cores and drawbacks are not necessary in this class of casting, and I would suggest the following method, which has proved successful in numerous similar bedplates:—

(1) Make a rough cast grid to give ½- to ¼-in. clearance between grid and pattern, with two W.I. staples cast in.

(2) Ram the grid in the bottom of the pattern to about 1¼-in. thickness of stiff loam; lift out the loamed grid and bake.

(3) When ramming the top part of the mould, place the loam grid in the bottom of the pattern; ram up the mould in green sand in the ordinary manner and secure the grid to the top box bars by means of the two staples. When the top is raised, the loamed grid will ensure a perfect lift of the deep cod.

(4) Sleek the joint of the loam cod and the green-sand cod. Wet-black the joint and dry off with fire or torch.

(5) When the top part is finally closed on, the cod is in the correct position to definite wall thicknesses, and there is no risk of sand or dirt inclusions or misplacement of the cod.—Yours, etc.,

B. GALE.

42, Forster Street,
Smethwick, Staffs.
January 30, 1943.

(*Continued from next column.*)

CANADIAN SHIPYARDS ARE WORKING on a construction programme which much exceeds that of the last war, both in the number and deadweight tonnage of ships delivered and in the speed of construction, states the Canadian Munitions and Supply Department. In 1942, Canada delivered more than 60 steel cargo ships, totalling 634,000 tons deadweight. One of the 10,000-ton ships was delivered 88 days after the keel was laid. The fastest recorded time in the last war was 91 days for an 8,800-ton ship.

A FEATURE OF mineral production in Canada in 1942 has been the increased output of tungsten, and new works have been erected in various parts of Canada in proximity to tungsten-bearing deposits. A promising discovery of chromite was made in Manitoba in 1942. A considerable amount of Canadian mercury is now available for export. An important increase took place in 1942 in the Canadian output of metallic tin. The outstanding achievement of the year, however, was the production of metallic magnesium from dolomite rock.

CANADIAN NOTES

Iron Ore Tests

Further tests of hard lode iron ore from Steep Rock Lake in Ontario, which may provide a solution of the American scrap problem, have been carried out in the open-hearth furnaces of the Republic Steel Corporation, with results described by observers as satisfactory. Four tons of ore having an iron content of from 61 to more than 65 per cent. was used. Scarcity of scrap, it was stated at the tests, makes it imperative to use an ore hard in structure and low in impurities for direct charging into open-hearths. The Steep Rock ore lies at the bottom of a lake 130 miles west of Fort Williams, Ont. Explorations indicate a deposit of 100,000,000 tons. A year of drainage and construction work would be needed to make it readily available. At least a million tons could be taken out in 1944 and 2,000,000 more in 1945, it is estimated, if material and men are made available so the development could be started at once. The Canadian Government is said to be planning the expenditure of several million dollars in its development.

New Steelfoundry

At a cost of $1,000,000, a new steelfoundry for Hull Steel Foundries, Limited (Canada), is being built over and around the present plant, which is continuing production on a 24-hr. basis. When the new outer shell is complete, the present smaller foundry will be dismantled. The new foundry will be 518 ft. long, 101 ft. wide and over 70 ft. high, with 85 per cent. of wall space in steel sash and glass. Along the sides, the glass panel will be 475 ft. long and 36 ft. high. General construction will be of brick and steel, and provision is being made for cranes to operate inside on 95-ft. tracks. Attached to the new foundry will be a service building, housing time office, washing and locker rooms, and lunch room accommodation for 1,000 men. Hull Steel Foundries, Limited, in peacetime manufacture mining and transport steel castings.

ALTHOUGH CANADA'S steelmaking capacity increased by 320,000 tons last year, output is filling less than 60 per cent. of the country's requirements.

ADDITIONAL DETINNING PLANTS are being completed in Canada, and it is estimated that this year 400,000 tons of material will be detinned, as against 250,000 tons in 1942.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, Limited, and subsidiaries, made a net profit for the nine months ended September 30, 1942, of $24,377,124 after all charges. This compares with a net profit of $25,695,938 in the corresponding period of 1941.

CANADA'S NEW $5,000,000 MAGNESIUM PLANT is now in operation. Canada's entry into the field of magnesium production is based on discovery of a new thermal extraction method applied to large but little-worked dolomite deposits at Haley's Corners, near Renfrew.

(*Continued in previous column.*)

METHODS OF MOULDING AND CASTING A SLIDE BRACKET

IN STEEL, CAST IRON AND BRONZE

Discussion of practical problems and the comparative merits and demerits of various methods

At a recent meeting of the Sheffield Branch of the Institute of British Foundrymen, MR. T. R. WALKER, M.A. (Branch-President) said it was proposed to continue the discussion held in the summer and reported in the "Foundry Trade Journal" for August 13, 1942. The points of difference then raised had created so much interest among the patternmakers and moulders that castings had been made in cast iron, steel and bronze, by the local foundries, for examination and discussion.

The discussion was opened by MR. W. H. SALMON, who said that the design shown in Fig. 1, a slide bracket casting, was one of the questions for Foundry Practice and Science in the London City and Guilds examination in 1940. This design was selected for discussion because it can be moulded in so many different ways, depending on the quantities required.

In order to standardise the terms used for the different portions of the casting, they have been described on the drawing (see Fig. 1) as follow:—The *flange* is 8 in. dia. by 1¼ in. thick; the *cylinder* is 4½ in. outside diameter by 2 in. inside diameter by 8½ in. long (wall thickness of 1¼ in.); the *bracket* is a triangular shaped piece, 11 in. wide, tapering to 4½ in. by 1¼ in. thick; there are two *stiffening webs*, 1 in. thick, from the cylinder on either side of the bracket; the *slide* is 11 in. by 4½ in. by 2½ in. wide (1 in. to 1¼ in. thick); the *groove* is 2 in. wide by about 8 in. long, with semi-circular ends; and there are two *small bosses*, which are 3 in. dia. by ½ in. deep, on the opposite side of the slide. The position marked X on section A—A shows the position of a dangerous "hot spot" at the intersection of the cylinder (1¼ in. wall), bracket (1¼ in. thick) and webs (1 in. thick).

The first point of interest, for the student, was that no moulder would attempt to use this pattern in the position shown on the blueprint; so that the first thing he should do is to turn the blueprint round, view it from a different direction, to get a better idea of the difficulties, and to visualise the cores or loose pieces which would be required, to make those parts of the design which will not "draw."

If the blueprint is turned through 90 deg. to the right, and the "lower" view considered as an elevation, so that the *flange* is at the bottom, it is apparent that if the mould is jointed along the *bracket* and transversely through the cylinder, the only piece which will not draw is the flange. While the blueprint is in the same position, and considering the "upper" view as an elevation, the pattern can be split horizontally through the cylinder and flange, and transversely through the slide, but now the two *bosses* would not draw, unless they were made D-shaped. In addition, the half round ends of the shallow *groove* in the slide are also a difficulty and would have to be cored.

The drawing does not indicate that any machining is required, but it may be assumed that the *slide* will be a fitting face and will have to be machined. Therefore, the casting should be moulded so that the slide can be cast with the *groove* downwards if possible. If the groove must be cast uppermost, an extra machining allowance is needed on this surface.

At the previous meeting a half-size pattern or model was used for demonstration. Some of the castings

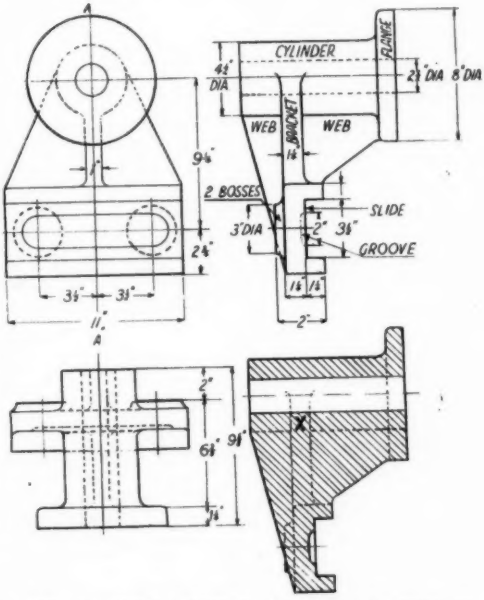

FIG. 1.—SLIDE BRACKET CASTING. WEIGHT IN STEEL: HALF-SIZE, 12¼ LBS.; FULL-SIZE, 100 LBS. NOTE HOT SPOT AT X.

shown to-night have been made off this pattern and the others have been made full size. One lesson to be learned from a comparison of the castings is the great difference in patternmaking time, the amount of timber, the moulding time, and the weight of metal used for the two sizes of casting. "Half size" means that the dimensions are reduced in three directions. The half-size casting is only a midget. The full-size

Moulding and Casting a Slide Bracket

casting is *eight* times as heavy, for instance, the half-size steel casting weighs 12¼ lbs., the full-size casting (without feeder heads) weighs 100 lbs.

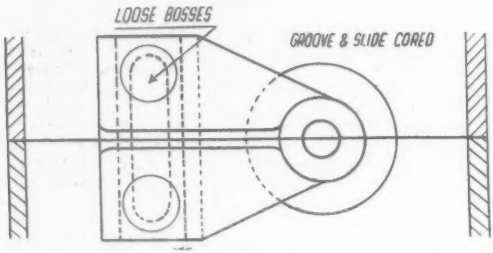

FIG. 2A.—NO. 1 METHOD OF MOULDING, WITH LOOSE BOSSES.

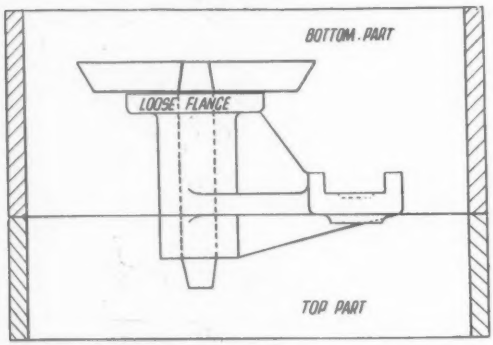

FIG. 2C.—NO. 3 METHOD OF MOULDING, WITH LOOSE FLANGE AND COVERING CORE.

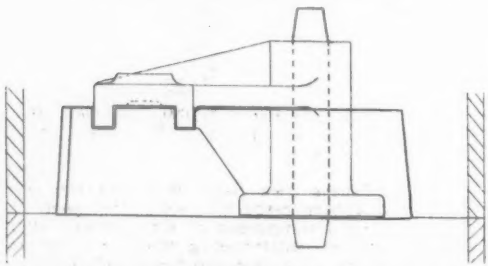

FIG. 2E.—NOS. 5A AND B METHODS OF MOULDING, WITH BLOCK CORE AND FLANGE PRODUCED IN CORE OR MOULD.

Potential Methods of Moulding

Apart from different methods of gating and heading which could be seen on the castings exhibited, at least five different methods of moulding have been

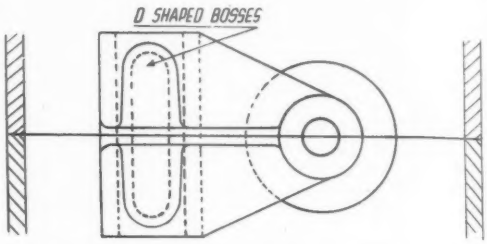

FIG. 2B.—NO. 2 METHOD OF MOULDING, WITH D-SHAPED BOSSES.

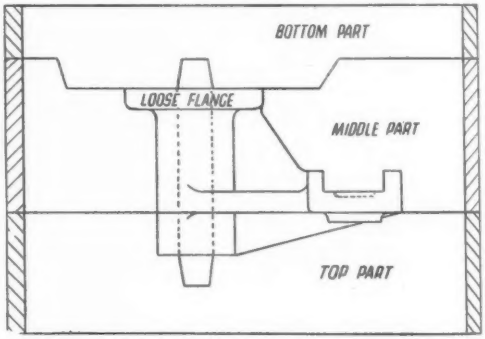

FIG. 2D.—NO. 4 METHOD OF MOULDING, EMPLOYING A THREE-PART JOB.

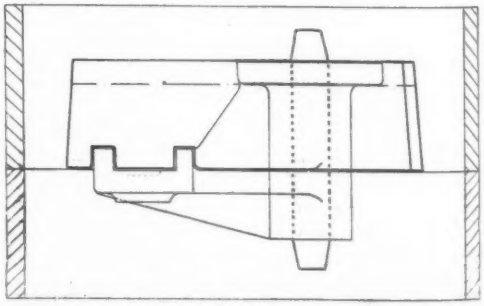

FIG. 2F.—NO. 5C METHOD OF MOULDING, WITH SLIDE AND GROOVE CAST UPWARDS.

Moulding and Casting a Slide Bracket

suggested. These are illustrated in Figs. 2A to F, and by the various patterns on view.

Method No. 1.—Jointed so that the cylinder and webs lie horizontally in the mould, and with the slide vertical. The two 3-in. dia. bosses must be loose, either pinned or dovetailed (Fig. 2A).

Method No. 2.—Similar to No. 1, except that the bosses have been made D-shaped so that they will draw (Fig. 2B).

Method No. 3.—Flange down, using a covering core, or covering chill, in the bottom part. In this case the flange on the pattern must be loose. This is probably the method the examiner had in mind when he set the question. Note that the mould is shown upside down to show how the loose flange is extracted after partially ramming up the bottom part (Fig. 2C).

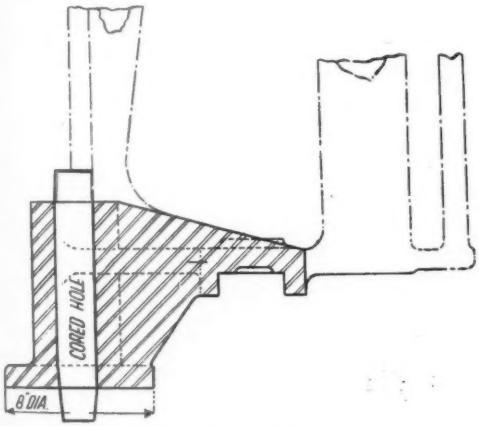

FIG. 3.—SECTION OF STEEL CASTING, CORED, WITH DEFECT AT INTERSECTION OF CYLINDER BRACKET AND WEBS, AND A SLIGHT DEFECT ALONG THE CENTRE OF THE BRACKET.

Method No. 4.—Using a similar pattern, but made as a 3-part mould (Fig. 2D).

Method No. 5 (A, B and C).—This method was suggested for mass production. The whole of the casting from the flange to the bracket, and including the slide and groove are made in a block core, which is seated on the bottom part of the mould. A method of this kind would be used also by a foundry using core assembly, in oil sand or cement sand mixtures (Figs. 2E and F).

Method No. 5A.—Flange down and flange produced in the block core.

Method No. 5B.—Flange down but produced in the mould.

Method No. 5C.—Flange upwards. This method puts all the pattern in the bottom part and avoids any danger of mismatching.

Practical Results

Three castings have been made in steel and sectioned. It will be remembered that at the last meeting, Mr. Meredith said that he would omit the round core from the cylinder, which meant that the 2-in. dia. hole would have to be drilled from solid. In his opinion, this was necessary for steel, in order to get sufficient feed down to the intersection marked X at the junctions of the cylinder, bracket and webs. Against his better judgment, the first two steel castings were made with the 2-in. dia. hole cored. In both cases sectioning revealed a shrinkage defect at the dangerous intersection (Fig. 3). There is also a slight defect running along the centre of the bracket, due to the X intersection of the webs and bracket.

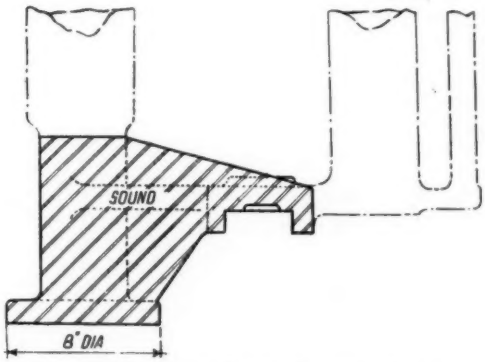

FIG. 4.—SECTION OF STEEL CASTING, CYLINDER CAST SOLID, SOUND.

Even in the midget steel casting, there is a defect at the X position.

Another steel casting had just been made, with the cylinder cast solid and a full-size head. The section shows that the defects have been eliminated. The method of running and heading is shown on Fig. 4.

MR. MEREDITH continued the discussion with a description of the method of making the steel castings in dry sand by method No. 3. They had been run into an L-head attached to the slide (see Figs. 3 and 4). For the cored casting, a head had been placed over half the top end of the cylinder, in an attempt to feed down to the hot spot at X in Fig. 1. However, that casting was defective (Fig. 3), and the sound casting (Fig. 4) had been run in a similar manner, but with a full-size head over the cylinder, which had been cast solid.

Moulding and Casting a Slide Bracket

He was sorry that owing to the illness of Mr. Webb, it had not been possible to get the casting made with a whirl-gate head in time for the meeting.

He thought that this casting was an object lesson for designers who were asking for complicated attachments casting integral with hydraulic cylinders. Cylinders with crossheads, steam chests and valve boxes were often made. Most cylinders have to be cored, and the present example illustrates the dangers of designs which are unsuitable for the production of sound castings.

With regard to the extra machining, involved in drilling the 2-in. dia. hole from solid, he had found that machinists prefer to drill a hole from solid, rather than bore out a cored hole which might be slightly out of centre, and cause the tool to run off. It was cheaper to drill a hole from solid than to have a waster casting, on account of a defect which would not be found until the cored hole had been bored out to finished size.

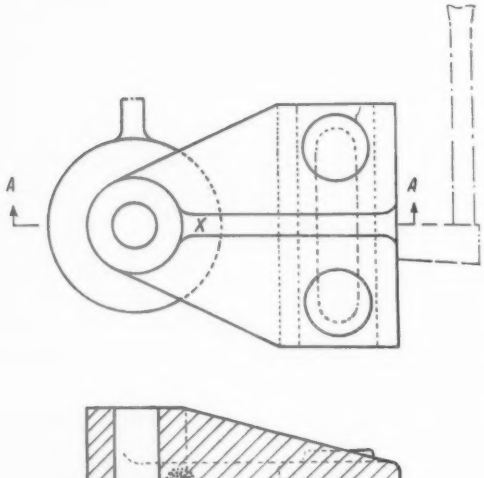

FIG. 5.—SECTION OF IRON CASTING, CYLINDER CORED. BELOW IS SECTION SAWN AT AA, SHOWING POROUS AREA AT X.

As a Cast-Iron Job

MR. BRITTAIN had made a full-size casting in cast iron by method No. 1 (see Fig. 2A). in green sand. The pattern, he said, had been made by a student of 18 years of age, who was told the casting was to be cored at the slide. The pattern was sent into the foundry as a commercial job, and the hand moulder left to his own devices as to the method of running. As shown in Fig. 5, it was run into the centre of the end of the slide, to get the metal across to the cylinder as quickly as possible. The moulder had put a small riser, ¼ in. dia., on the upper side of the flange. Until Mr. Salmon had 'phoned yesterday, that the steel casting showed a shrinkage cavity at X, it had been assumed their casting was sound, there was no sign of defect on the outer surface. However, a small search hole had been drilled, and had revealed some porosity in the centre of this section, but not to the same extent as in the steel casting. (Later: This casting has since been sawn and the result is shown in Fig. 5.)

MR. HOLLIS said that the facing sand mixture consisted of 72 per cent. red sand, 15½ per cent. floor sand, 12½ per cent. coal dust, and gave the following results on A.F.A. test-pieces tested on two successive days:—

Moisture, 8.7 to 7.5 per cent.; *green strength*, 12.875 lbs. to 11.5 lbs.; *A.F.A. permeability test*, 85 sec. to 61 sec.

The core sand was made from 63.2 per cent. floor sand, 31.6 per cent. red sand, 5.2 per cent. Spermolin, and the A.F.A. sand tests showed: Moisture, 5.5 per cent.; green strength, 8 lbs.; dry strength, 1.24 lbs. The drying temperature of the core sand test-pieces was not controlled and their dry strengths show a variation.

The metal used for the casting was a common engineering cast iron, grade A; minimum tensile strength of 12 tons per sq. in.; Brinell hardness, 200 to 250; transverse strength, 19.000 lbs. breaking load with a deflection of 0.17 in. The composition of the metal: T.C, 3.47; C.C, 0.70; Si, 1.66; Mn, 0.73; S, 0.090; and P, 0.800 per cent.

The unetched microstructure showed a rather fine graphite structure, somewhat broken up. The etched micro revealed the phosphide eutectic, which would be expected with 0.8 per cent. phosphorus content.

MR. DAYBELL said that for mass production he would use No. 3 method, but would use a smaller print area to save core sand and drying costs. If sectioning reveals a cavity even in the casting with the larger head, he would certainly cast the cylinder solid with a good head on top, as has been done with the sound steel casting.

Mr. Daybell said he had made two half-size castings in green sand in a bronze of the following composition: 88.25 per cent. copper, 10.5 per cent. tin. 1 per cent. nickel, and 0.25 per cent. phosphorus. In considering the drawing, the first thing to do was to visualise where trouble might be encountered due to hot spots, and then to decide whether to make it by mass-production methods, or just as a "one-off" job. A half-size wooden model had been made pre-

Moulding and Casting a Slide Bracket

viously for lecture purposes, and he decided to use this model as a pattern, and moulding by method No. 3 as a "one-off" job, with a cake core covering the flange. Fig. 6 shows how the casting was run with the downgate running into the flange at the bottom, and a runner bar across to catch the dirt. The ingate area was made smaller than the downgate, to allow the metal to rise quietly in the mould. A feeder head was placed over the place where the hot spot was expected, and it was hoped to get the cooler metal into the slide portion, furthest away from the runner. One casting was made with a rather large head, and a second casting with a smaller head to see if it was possible to get a better yield. However, the second casting shows a shrinkage defect at the hot spot, and the defect was visible in three places: (*a*) In the bore opposite the bracket; and (*b*) and (*c*) in the corners at the junction of the upper web, the bracket and cylinder. The bronze castings had not been sectioned. (Later: The two bronze castings have been sectioned as shown in Fig. 6. A further bronze casting, with the cylinder cast solid, was sound.)

MR. MORLEY said he was sorry he had not been able to make the aluminium and magnesium castings in time for the meeting, but hoped to be able to submit a complete selection of castings in different light alloys to illustrate their differing casting properties, for discussion at a meeting in the New Year. He had decided to cast "slide uppermost," but had not carried out any tests to see whether he could obtain satisfactory soundness in the casting.

Chills and Denseners

MR. OFFILER said the discussion had been very interesting, and he was pleased to see on the table, patterns and castings made by the various methods discussed at the previous meeting. Nobody had mentioned chills and denseners to cure the "hot spot." (Mr. Meredith interposed that he did not like to use internal denseners in castings which had to withstand pressure). Continuing, MR. OFFILER was interested to hear that the pattern for method No. 1 had been made by a student of 18 years of age, because he had done good work. He was pleased to see he had provided a suitable taper on the core prints for the core making the groove and slide. The surface of the cast-iron casting might appear rough, but when one of his foundry friends was asked to make a machinable casting, he always provided one with a poor skin because he did not use coal dust. On the other hand, he used coal dust if he wanted a good skin on iron castings which were not to be machined. Personally, he would not use method No. 1, but would prefer to make this casting as a three-part job with flange down, method No. 4 (see Fig. 2D), and did not think there would be any difficulty in getting it sound at the X position in cast iron. With method No. 1 there is a possibility of getting a dirty place at the top end of the slide, when the slide was cast vertically, and he was surprised that the moulder who had used method No. 1 (Fig. 5) had not run a couple of whistlers off the top of the slide, similar to the small riser on the flange. Reverting to the question of surface appearance he thought that too much attention was paid to the skin of iron castings nowadays. They may have a beautiful, blacklead, polished face, but machining often showed there were bright gas holes underneath the skin.

Surface Appearance and Soundness

In reply to Mr. Brittain, MR. OFFILER said that in his experience as a user of iron castings, he had noticed that the rougher the surface, the sounder the casting when it was machined. Green sand castings should be made in a different sand if the surfaces were to be machined. If the usual amount of coal dust were used, there was a tendency to get gasholes.

MR. MEREDITH said that so far as steel was concerned, he did not believe it was necessary to have a

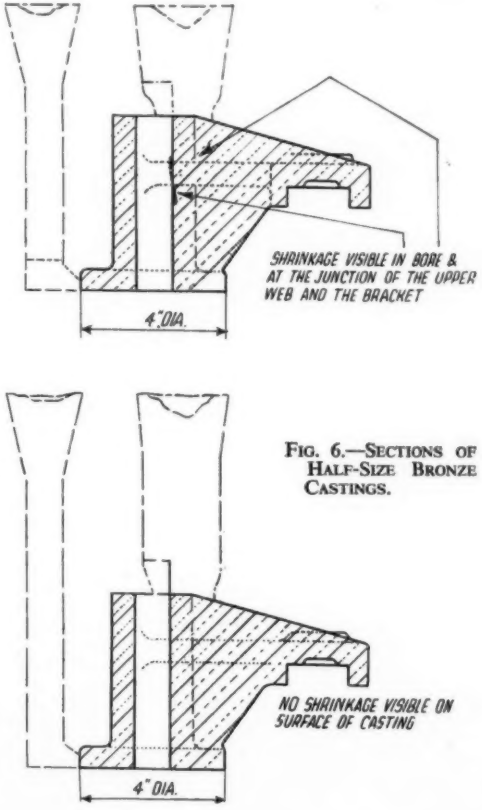
SHRINKAGE VISIBLE IN BORE & AT THE JUNCTION OF THE UPPER WEB AND THE BRACKET
4" DIA.
NO SHRINKAGE VISIBLE ON SURFACE OF CASTING
4" DIA.

FIG. 6.—SECTIONS OF HALF-SIZE BRONZE CASTINGS.

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rough surface in order to make a casting which would machine up "sound"; he would use a more open sand for green sand than for dry sand.

MR. OFFILER suggested that a discussion on "Surface Appearance *versus* Machining Soundness" would be a fruitful subject for a further meeting. The tendency, particularly with cast iron, was, he said, to try to get blue surfaces at the expense of soundness. Comparing the methods of moulding from a mass-production angle, he preferred to use method No. 5, thereby reducing the weight of the core as Mr. Daybell had suggested.

Cross Joints

MR. BRITTAIN referred to the danger of mismatching across the cylinder, but MR. MEREDITH said that he would work to a jig fitted to the box pin holes for locating the core. Mismatching was due, he said, more often than not to loose dowels and loose pins. A patternmaker should realise that the production of moulds by a machine means that the pattern and

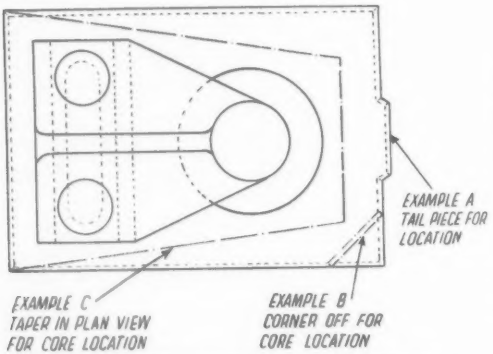

FIG. 7.—THREE METHODS OF CORE LOCATION.

its maintenance must be as accurately done as any of the delicate work in the tool rooms of the machine shops.

MR. DAYBELL agreed and said that accuracy was the first essential when producing patterns for mass production on machines.

MR. MEREDITH said he would make the mould in green sand by method No. 5, then the parts which were machined would have the advantage of being cast on a dry sand core.

MR. OFFILER insisted that when rigging patterns for machine moulding the patternmaker should study the more rigorous standards thereby required. In fixing rapping plates to hand patterns, the patternmaker often used a ¼-in. screw when a 3-in. screw was necessary for the weight of pattern. The patternmaker should also place the rapping plates so that the moulder did not get ovality in the casting.

Core Setting

Some discussion followed on the best shape of the setting piece for the block core in method No. 5. The pattern had been made with a tail piece, as shown in example A (Fig. 7), to indicate the correct location in the mould. Both Mr. Offiler and Mr. Turvey preferred to cut a corner off the core (example B). Mr. Daybell had suggested the core shape could be made smaller, and MR. H. F. CLARKE suggested that if this core was tapered in the length and depth as example C, even an unskilled man could not put it in the mould the wrong way round.

MR. DAYBELL suggested that the crosspiece, locating the loose flange in the corebox (method No. 5) should be fitted with a screw and wing nut for quick release in coremaking.

MR. SALMON explained that this corebox had not been used yet, but had been brought to the meeting for demonstration purposes; the steel castings had been made by method No. 3. If more than one core were required, thumb screws would have been provided for speeding up the coremaking.

Remedying the Defect

MR. F. E. STEELE, in replying to Mr. Brittain's question as to why there was this defect at the X position in Fig. 1, explained that the founder was dealing with a material which was changing from liquid to solid; every metal (except type metal) shrank whilst setting. If one could affix a good feeder head, near to position X, to counteract the rapid cooling of the webs and bracket and enable the junction to be fed, the difficulty would be overcome. The shrinkage varied according to the metal. Some people might recommend a refined iron, or nickel iron, to close up the structure. Others might advise to cast cold, as casting temperature played an important part. The trouble was due to the design and not to moulding. The thick sections could not get fed through the thinner bracket and webs.

He thought it would need a large-size internal densener to cure this shrinkage. It was usually found that the spongy section occurred in the top half of the mould. Designers should cater for the rate of freezing of different sections of a casting to visualise where the fluid metal was to come from to feed the hot spots. In making iron castings to such close tolerance that the machine shop staff would grumble if they varied by 1/64 in., setting the patterns on the machines was a very important factor, and the wood or metal patternmaker should take a deep interest in this side of the subject. The patternmaker should envisage the moulder's difficulties, and when making a corebox should so do it that it would be impossible to set the core incorrectly.

Advantages of No. 1 Method

He wondered why this casting could not be made in steel by method No. 1. Apparently the "slide" was to be machined and he would expect more trouble

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with method No. 5 (slide uppermost) than with method No. 1 (slide vertical). An extra ½ in. and a good head could be put on the top of the slide if method No. 1 was used. In addition, the hot spot at X could be cured, when the cylinder was cast horizontally, by using three more heads, one on the flange, one on the opposite end of the cylinder and one over the hot spot. Of course, in removing the latter head, the casting would have to be sawn or shaped and ground. Whatever metal was used—steel, iron or bronze—there was always trouble at these rapid changes of section. He made an iron casting which varied from 1 in. thick in the centre, running down to $\frac{5}{16}$ in., and had sponginess in the 1-in. section, even though he had a large riser at the side to feed the thicker section. One might have the weight of heads and runners as heavy as the casting, and still obtain sponginess, due to the design and to the pouring temperature.

Customers are apt to look for a good skin on iron castings, but they also required them to machine up "sound"; although very often the two cases did not go together, one tried to get the best combination. Ninety-eight per cent. of his castings were machined on three out of four sides, so that it did not matter in which way the pattern was placed in the mould, and yet he endeavoured to get a skin which would be satisfactory for cellulose painting. He did not believe in using a quantity of coal dust. In a casting such as this slide bracket, the moulder could assist by venting, even though the sand was not so permeable as he would wish, by using the vent wire, which was one of the moulders' most useful tools. By venting round the pattern, and at the joint, he could avoid much danger. For mass producing grey-iron castings he preferred method No. 1, providing he had good moulding boxes and machines which gave well matched parts. He had less than 2 per cent. cross joints in his castings, because he worked to less than 0.004 in. clearance on the box pins.

Method No. 1 Criticised

MR. MEREDITH disagreed with Mr. Steele regarding mass production by method No. 1. The sand would not bump tightly into the corners of the vertical wall; one would get swollen castings, so that much tucking would be necessary when using a bumping machine. If the pattern was to be rammed and the pattern drawn by machine, the pattern would be knocked to pieces very quickly by the moulder, moreover, the bottom corners would be soft-rammed.

MR. DAYBELL supported this argument and was afraid that mass production by method No. 1 would give badly-shaped castings.

MR. MEREDITH said that on a brand new jolt machine everything would be satisfactory, but as soon as it wore slightly, and one had the slightest roll, the bosses became oval. He preferred to make the moulding process for mass production as foolproof as possible. In method No. 1, the mould required some skill, whereas, with method No. 5, the job was simplified.

Vertical Moulding for Cylinders

MR. READ did not think the cylinder portion should be moulded horizontally, even in cast iron; it should be cast vertically, otherwise it would be contaminated by gasholes in the top of the core. Further, he would use suitable hot iron. For grey-iron castings to be machined, he believed that the rougher the casting the better it machined. Grey-iron castings possessing a smooth, sleek finish are invariably imperfect. As a foreman, he would stop everybody sleeking-up jobs, prohibit the use of blacking bags, and eliminate coal dust.

MR. OFFILER preferred hotter iron associated with a few extra whistlers. These factors had combined to cause some trouble he had had with 56-lb. pulleys.

MR. DYSON asked how the core print (in method No. 1) would be designed to position the core for the upper half of the slide in the top part.

MR. STEELE replied that the core would have to be fastened up in the top part with sprigs.

MR. DYSON also thought that the riser should be transferred to the opposite side of the cylinder, with the riser blended a third way down the outside of the cylinder.

MR. WALKER reminded the members that earlier in the meeting Mr. Offiler had suggested the application of denseners.

MR. MEREDITH said that the hot spot could have been cured by means of internal denseners, or external chills, but he avoided them where possible. He had considered the job as a cylinder which would be subject to pressure.

Pattern Costs

MR. OFFILER compared the cost of the pattern and its maintenance for 1,000 off; the upkeep costs for method No. 1 would be 75 per cent. greater than for method No. 5. This was a costing item which must be considered on production work. Such points were sometimes forgotten when the forman pattern-maker was questioned about the cost of his patterns and their upkeep.

MR. WALKER said that this discussion had shown the advantages of co-operation between the designer and the foundryman, and, further, that apprentices, whether patternmakers or moulders, should share their time between the patternshop and the foundry, and should even be sent into the fettling shop to see the castings they have made.

Half Cores for Method No. 1

MR. MEREDITH was interested in the pattern for method No. 1, using two half-cores for the slide, with the core prints as shown in Fig. 8 (A). As soon as the corebox became worn, the cores would tend to fall in, and one would never be certain of having the machining allowance in the slide. If he wanted to make the casting by method No. 1, he would take the core print further out on the sides of the slide and even on the end of the slide, see Fig. 8 (B), in order to provide a firm seating for the core.

MR. BRITTAIN pointed out that that would leave a narrow pocket of sand, but Mr. Meredith said it was worth the risk.

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MR. HOLLIS, referring to porosity, said the composition of the iron was important, and he fully expected that the iron casting would be porous, especially in the region of the X section. In cast iron, a good deal of the shrinkage porosity was due to the wide range of solidification from the start of freezing to the freezing point. With phosphoric iron, one had a wide range of solidification, so that increased porosity was to be associated with phosphoric iron. By controlling the casting temperature the amount of "drawing" could also be controlled. He agreed that a good deal of machining trouble was due to the excessive use of coal dust, and said that cast-iron castings could be obtained with good surfaces without the use of excessive coal dust.

MR. SALMON, speaking about redesigning the slide bracket to avoid the occurrence of the hot spot at X on Fig. 1, said that it had been shown that when a

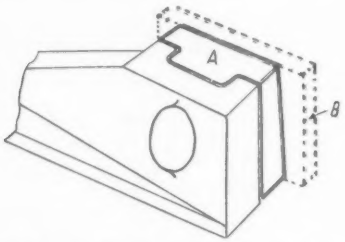


FIG. 8.—CORE PRINTS FOR METHOD NO. 1. B SHOWS METHOD OF PREVENTING THE CORE A FROM MOVING.

mould is filled with molten metal, the freezing proceeds at the same rate from each sand surface with which the metal is in contact. There was little difference in the rate of skin formation, whether the metal was lying in green sand or dry sand moulds, but, of course, the rate of skin formation was greater from a chilled surface. In the case of this "hot spot" in the slide bracket, freezing along the bracket and cylinder would leave a pool of liquid metal at the thick intersections. The remaining liquid would solidify and shrink, leaving a cavity at X because the connecting passages had already frozen up. One method of overcoming this type of defect was known as "coring out the hot spot," which was achieved by inserting a core at the junction of the webs and bracket to cut away portions of the intersections. The remaining thicknesses would be more uniform, the molten metal would be solidifying uniformly from all the surfaces, and the elimination of the thick section would give a sounder casting.

MR. READ said this method was adopted for all cylinders made by his firm, and MR. MEREDITH said that slot cores were used at the end of the arms of spur rims to core out the hot spot.

Vote of Thanks

MR. WALKER, in proposing a vote of thanks to all participants in the discussion, said that it was noteworthy that the only sound casting on view off this pattern was the one in which the design had been altered by casting the cylinder solid.

After Mr. Steele had supported, MR. SALMON said he specially thanked Mr. Daybell, Mr. Brittain and Mr. Meredith and their respective firms for their assistance in providing models, patterns and castings for discussion that evening.

FRENCH IRON AND STEEL TRENDS

A survey of the French iron and steel industry, made early in January and just received, lays emphasis on the marked activity at the metallurgical works. Producers are very busy, especially those making structural steel, and are engaged exclusively on German account. Employment at the works is now higher than in pre-war years. Although in the past there has been some difficulty in maintaining adequate supplies of raw materials to the works, most needs have been met. The coal situation gave serious concern last year, but by a reduction of quotas to non-essential consumers, such as those in the domestic group, better supplies have been diverted to the iron and steel works.

Under German ægis, the works in France have undergone various fundamental changes to improve the volume of finished products supplied to the Reichswehr and ancillary German industries. Many plant expansions are reported, as well as extensive rationalisation of operations. It is expressly stated that these measures have been made possible by the close collaboration between the German and French armament industries. Concentration of production forms another facet of this adaptation of the industry to German needs, and has led, it is claimed, to a marked increase in the volume of output.

Among the changes which have taken place, some prominence is given to the transfer of the tube works of the Commentry-Fourchambault concern to the Louvroil-Montbard-Aulnoye company, which has issued new shares to the value of 14.6 million fcs., raising its capital to 287.5 million fcs. Louvroil is also planning a further capital increase to 450 million fcs., to cover further extensions and acquisitions. Generally, French stock exchange quotations of industrial shares consistent with inflationary movements are very high, and considerable paper fortunes have been made in dealings in these shares; current quotations for the new Louvroil shares value the capital increase at 30 million fcs. The Fives-Lille engineering and locomotive works, which was bombed recently, is raising its capital by 200 million fcs., and is reported to be very busy on French and German orders. The same might be said for many of the principal iron and steel and engineering works.

BOOK REVIEW

Essential Metallurgy for Engineers. By A. C. Vivian. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 8s. 6d.

This book gives an inaccurate picture of physical metallurgy as it is to-day, and is so full of inconsistencies that it is suitable neither for students nor engineers. The author commences to develop his personal conceptions in Chapter 2 under the title "The Amorphous Structure," and, after reading it and the following chapter, entitled "The Crystalline Structure," one would necessarily obtain the impression that it was not at all difficult to obtain a steel containing a considerable percentage of amorphous iron. The truth is, of course, that the amorphous iron theory is now largely discredited.

It is also somewhat disconcerting to read in Chapter 2 that liquids, when hot, are "limpid." Within ten pages the word "limpid" is used more than half a dozen times, and it is not at first obvious that the author is misusing the word. "Limpid" means clear or transparent, but the author is apparently under the impression that "limpid" is the opposite of viscous. Chapters 4, 5 and 6 are devoted to a consideration of solid solutions, metallic compounds, and eutectics and eutectoids, respectively, and none of them gives a clear picture of the various subjects. The chapter devoted to metallic compounds is particularly poor, and the author fails to give a reasonable definition of a compound. There are 24 chapters in all and inconsistencies and mis-statements are frequent.

On page 58 there is a reproduction of the whole of the iron-carbon diagram and of a part thereof, but unfortunately the two do not agree. According to one diagram, a 1 per cent. carbon steel has transition points at 700 deg. and 850 deg. C., whereas according to the other the points are at 700 and 780 deg. C. On page 71 it is stated that a 1.2 per cent. carbon steel may have its hardness varied from 430 to 220 Brinell by varying the tempering temperature. A 1.2 per cent. carbon steel that has been properly hardened and then tempered at, say, 200 deg. C. has a Brinell hardness of 600. In three short paragraphs devoted to a consideration of burnt steel, the author omits to mention that, in the steel industry, steel is said to be burnt when incipient fusion has taken place.

In Chapter 13, which is devoted to the case-hardening of steel, it is stated that cyanide fumes are given off by a bath of molten sodium cyanide. The fumes given off by a bath of molten sodium cyanide consist essentially of sodium carbonate and only the merest trace of cyanide is present.

In spite of the importance of high durability tools, steels and alloys, they are dismissed in less than a page and the information given is not correct. Stellite, for instance, has been well known for more than 40 years, and it does not consist of tungsten and chromium carbides set in a matrix of cobalt metal. The statement that cemented carbides are produced by fritting tungsten carbide crystals by metallic cobalt at high temperature and pressure is also incorrect. Cemented carbides are not heated under pressure. In the chapter devoted to alloy steels it is stated that silicon steel for transformer cores, etc., may contain 1 per cent. manganese. Such material with 1 per cent. manganese would be quite useless.

The book concludes with a glossary of metallurgical and other terms and expressions, and this section again is far from satisfactory. It is difficult to understand why "Brinell Number" should be defined as "Hardness stress in kg. per square millimetre," "Diamond Hardness" as "Hardness according to a special hardness scale," and "Pyramid Hardness" as "Hardness by the Vicker's Testing Machine."

F. FERDINAND KAYSER.

PUBLICATIONS RECEIVED

Guide to the Properties of Wrought Aluminium Alloys. Published as Information Bulletin No. 2 by the Wrought Light Alloys Development Association, Union Street, 63, Temple Row, Birmingham, 2.

This 28-page brochure ranks high among publications issued by the aluminium interests—an industry which indeed has set itself a high standard. As the reviewer did some tests on duralumin 32 years ago, he would prefer the phrase "barely 30 years" to be changed to read "just over" when referring to the period over which strong aluminium-rich alloys have been available. The object of the publication has been to summarise the properties of those wrought aluminium alloys which are detailed in the various specifications issued by the B.S.I. or D.T.D. It is interesting to learn that a new booklet is in preparation designed to cover the important subject of heat-treatment. The Association has organised an Advisory Service Bureau and Information Department, and those of our readers encountering problems or seeking information in the field of wrought aluminium should avail themselves of the services offered by this organisation.

The Fire Guard's Pocket Chart. Published by Jordan & Sons, Limited, 116, Chancery Lane, London, W.C.2. Price 4d. or 100 copies for 30s.

This is an extremely useful little folder, as it contains all the essential details of the duties of a fire guard. The only mistake—at least, according to the instructions given officially in the reviewer's locality—is that a fire-fighting party should now consist of five members and not three as stated.

Tin in Mexico

Mexico is probably the only country on the American continent where pure tin tubes are now being produced and used for packing dentifrices and shaving creams. None of the Mexican tin production, which is reported to be about 800 tons per annum, is coming to the United States because it commands far better prices at home. Tin was mined in Mexico before the Spaniards entered the country, but the occurrences of the tin ore are widely distributed. Prior to 1930, only a few tons were produced annually.

American Metallurgical Scene—II

STEEL NEEDS FOR ARMAMENTS

More than 75 per cent. of the American finished-steel output of 5,300,000 tons a month is going into direct war use and the remainder into such essential industries as railroads, machinery manufacture, etc., states David F. Austin, acting chief, W.P.B. Iron and Steel Branch. Eighty per cent. of this steel is being delivered on ratings of A-1-a or higher. Regarding steel requirements, Mr. Austin pointed out that it takes about 38 tons of steel to make a medium tank and each cargo ship of the Liberty type now being made in quantity calls for approximately 4,500 tons of rough steel. Current production is around 70 ships a month. The big four-engine bombers take 15 tons of steel each, and fighter planes take 3½ tons. Some anti-aircraft guns use up 14 tons of steel each, and 16-in. howitzers need 576 tons of steel each, while half a ton of steel is used to make a 2,000-lb. bomb.

Steel Cartridge Cases

The development of steel cartridge cases in place of brass cases will save 50,000 short tons of copper in 1942 and 295,000 tons in 1943, states Lieut.-Col. J. H. Frye in "Product Engineering." The steel cartridge cases developed in the United States are quite as satisfactory as the brass ones, it is claimed. At first, electroplating was considered to solve the problem of rust and corrosion, but as this would involve the use of strategic materials, a special phenol varnish is now used which is also resistant to the chemicals from which gunpowder is made. Col. Frye estimates the savings in strategic metals only for the year 1943 as a result of many changes in the specifications of small arms, gun carriages, shell cases, fuses, etc., at 85,000 tons of primary aluminium, 24,500 tons of nickel, 8,750 tons of tungsten, 336,000 tons of copper, and 6,000 tons of tin.

Steel for Aircraft

Steel is playing a steadily increasing part in the production of airplanes in the United States. Progress has been made in the introduction of cheaper and more available steels in applications where alloys containing expensive materials were formerly employed. Engineers of the Carnegie-Illinois Steel Corporation, subsidiary of the United States Steel Corporation, are now perfecting, in co-operation with aircraft manufacturing concerns, plans for utilising low-alloy, light-gauge steel sheets and strip in the construction of airplanes. Even the "skin" of certain types of 'planes may now be made of improved steels—an application which for many years has been reserved for expensive non-steel alloys.

Repairing Large Castings.—One American colliery company, to conserve materials, is repairing large castings used in locomotives, coal-cutting and loading equipment, which are held in position by stud bolts, either by electric or acetylene welding of breaks or by filling the stud holes with bronze, then redrilling and retapping to the original size and centres. New threads are placed on mine-tub axles by building up with bronze and rethreading. Another company increases the life of centrifugal pump casings, by stopping the hole when the first leak appears, using brazing on the inside and building up thin areas in the same way. In this way several months of additional life have been secured.

Several hundred Krupp patents dealing with heavy machinery, locomotives, metal alloys, Diesel engines and internal combustion engines were among those recently seized by the United States Government through the Office of Alien Property Custodian, who licenses them to American companies.

United States steel production in October totalled 7,584,864 tons of steel ingots and castings, states the American Iron and Steel Institute. Production was 7 per cent. higher than the September total of 7,067,084 tons and exceeded by nearly 349,000 tons the output in October, 1941. The ten months' output totals 71,604,470 net tons, against 68,793,571 tons in the same period of 1941.

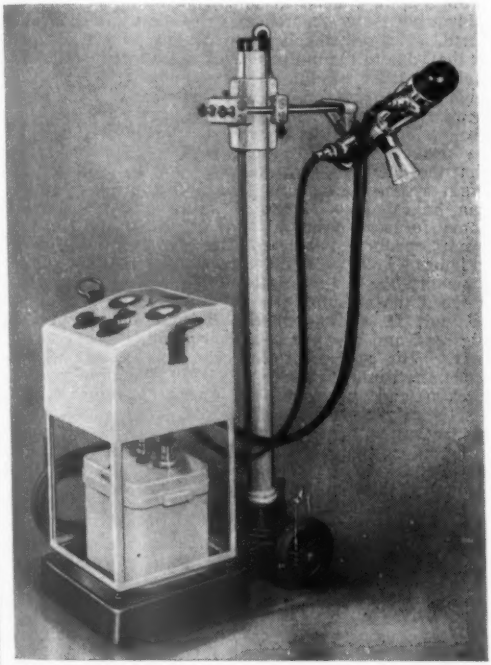
Iron ore consumed by U.S. and Canadian blast furnaces in the first ten months of 1942 totalled 71,010,316 tons, a gain of 13 per cent. over 62,772,674 tons in the corresponding period of 1941, states the Lake Superior Iron Ore Association. On November 1, 183 of the total 190 furnaces were in blast, as compared with 181 of 189 furnaces a month earlier. A year earlier 176 of 187 furnaces were active. Shipments of Lake ore exceeded 90,000,000 tons for 1942.

A mission of three United States experts has visited Brazil to study the possibility of establishing a complete aluminium industry in that country. The mission, which was invited by the Brazilian Government, inspected bauxite deposits in Brazil, investigated power possibilities, transportation and other factors necessary in large-scale manufacturing, and if their report is favourable, present plans call for the establishment in Brazil of the largest aluminium fabricating industry in South America.

To meet the ever-expanding needs of America for minerals and metals, the Reconstruction Finance Corporation has provided $3,990 million to permit the domestic production and acquisition of these strategic materials, stated Mr. C. B. Henderson, chairman of the Corporation, in a survey of the activities of the Corporation to October 26 last. In addition, the Metals Reserve Company has arranged for the purchase of 32 different metals and minerals in 36 foreign countries, and the Defense Plant Corporation has invested $6,191 million in war activities other than in the minerals and metals programme. To October 26, 1942, Defense Plant Corporation had commitments of $793,354,942 to increase annual iron and steel production. Also, provision has been made for increased capacity of coke and coal mining, iron ore, steel tubing and for the annealing and heat-treatment of steel.

A NEW INDUSTRIAL X-RAY UNIT

The new M.100 Industrial X-ray Unit, developed by Philips Lamps, Limited, Shaftesbury Avenue, London, W.C.2, consists of an h.t. transformer, a shockproof and rayproof X-ray tube, and a portable control table. The shockproof X-ray tube is provided with forced air cooling and connection to the h.t. transformer is effected by means of two shockproof h.t. cables. The h.t. transformer is accommodated on the base of a mobile trolley and the shockproof X-ray tube is mounted on a vertical column, provided with universal movements so that the X-ray tube can be adjusted to virtually any direction. For ease in transportation,



PHILIPS M.100 INDUSTRIAL X-RAY UNIT.

the control table is mounted on an angle-iron frame over the h.t. transformer, and can be removed and placed, if desired, on a bench in an adjoining room; alternatively, the frame, which is also removable, can be used as a stand. Connection to the h.t. transformer from the control table is made via a multi-core cable.

This type of equipment is capable of delivering up to 100 kVp., and the controls are of a very simple nature. With this equipment it is possible to examine

(*Continued at foot of next column.*)

THE McKEE WEAR GAUGE

The McKee wear gauge which will detect wear of as little as 15 millionths of an inch on metallic surfaces, is a recent development of the American Instrument Company, Washington. It is intended primarily for use in determining the amount of metal removed during grinding, honing or lapping, or as a result of ordinary wear. It is being applied in the production or rechecking of engine cylinders, crankshafts, bearings and other precision parts.

The method is based on the principle of measuring the width of a precision-impressed, diamond-shaped, pyramidal indentation. The depth of the indentation is a function of the peak angle of the indentor point; consequently, by measuring the width of the base of the indentation before and after wear has occurred, the depth of the indentation can be determined and the amount of wear calculated.

In some instances, it is desirable to know when an exact amount of wear has occurred, such as during a grinding or honing process. For this, the instrument is used to make an indentation of predetermined depth calculated from the amount of metal to be removed. The surface is then ground or honed only until the indentation is entirely removed, which indicates that the predetermined depth has been reached.

The particular advantage of the method, in its present application, is that it provides an indication of wear only, while the usual measurements of changes in dimensions, such as of pistons or cylinders, do not distinguish local wear or the differential between wear and such distortion as may have occurred during the test. The instrument itself is not only precise within the maximum measuring limit of 0.0014 in. down to a maximum of 15 millionths in., but is also flexible and is applicable to wear measurement on the inside of cylinders at any place within 10 in. from the ends and on any accessible spot on the outer surfaces of flats, cylinders or spheres.—"The Iron Age."

German Power Engineers

Under a recent German decree, all works in Germany which consume more than 500 tons of coal, 200,000 kw.-hrs. of electric power or 100,000 cub. m. of gas per month must employ an approved power engineer to supervise the efficient and economical use of all forms of energy, and reduce as far as possible the demand for power from public sources of supply during peak-load periods. The engineer must work in the closest collaboration with the electrical and gas authorities. Small works in the same locality can also be placed under the supervision of the engineer, in addition to the principal works under his control.

(*Concluded from previous column.*)

up to ¼-in. steel and 4 in. of aluminium by the radiographic method. It is eminently suitable for the inspection of aluminium and magnesium alloy castings, etc., whilst the unit of design of the equipment readily lends itself for incorporation in a conveyor belt system for the continuous inspection of such products.

AIR-CONDITIONING BLAST FURNACES

For each ton of pig-iron tapped from a blast furnace, approximately 1.75 tons of ore, 0.9 ton of coke and 0.4 ton of limestone are fed into it, and 3.8 tons of air is blown in the tuyeres. The raw materials of the charge have long been controlled, sized and blended with much skill, but little has been done with the 3.8 tons of air blown in, states G. F. SULLIVAN in "The Iron Age."

Several things could be done to bring the air variable under control. Each ton of air is made up of some 1,550 lbs. of nitrogen, which contributes little to the reduction process, about 600 lbs. of oxygen, which does all the work, and anywhere from 50 to 100 lbs. of water vapour, depending on the humidity. Two things could be done to the air, namely: (1) Remove some of the moisture, or, more important, maintain constant moisture content of the blast at a fairly low level, *i.e.*, employ dry-blast or air conditioning. (2) Use of oxygen enriched blast, thereby speeding reactions in the furnace, and cutting down of the volume of inert nitrogen passing through the furnace.

Four Moisture-Control Systems

The mechanism of oxygen enrichment is still too expensive and complicated. On the other hand, dry blast equipment and practice are each day becoming better known and more confidently accepted, after a checkered history. To-day, there are 19 furnaces on dry blast in the United States, most of them put into operation over the past year. On these furnaces, four systems of moisture control are being used: The Carrier system; the York system; the Kathabar system; and the Trane system.

The Carrier Corporation did much exploratory and development work several years ago, and the first modern furnace to be air-conditioned (the Woodward stack) used the Carrier system. The York system came into the picture shortly thereafter, and the Trane system is enjoying considerable popularity at the present time even though it is a relative newcomer in the blast-furnace field. The Kathabar equipment of the Surface Combustion Corporation has for several years been installed on a number of foundry cupolas, but only over the past year has entered the blast-furnace field.

Carrier and York use a standard refrigeration system and deliver air containing 3 grains of moisture per cub. ft. Trane is a regenerative system of the after-compression type; the Wheeling and Inland units are 1-grain plants, whereas the Globe Iron Company's equipment was installed as a 3-grain system, but, actually, is operating at 2 grains. The Kathabar system controls humidity independent of the air temperature by means of Kathene, which is essentially lithium chloride and acts as an absorption medium; moisture content can be dropped to 1 grain per cub. ft.

Optimum Moisture Content

There is considerable argument at present among blast-furnace operators as to what is the optimum moisture content of the air to the blast to be maintained with a dry-blast system. At the present time the majority of plants in which the blast is conditioned maintain a moisture content of 3 grains per cub. ft. All the published data and information to date giving the results of operation with dry blast have been on the basis of 3-grain operation. While there is much theoretical discussion in favour of dehumidifying the blast down to less than 3 grains, and as low as 1 grain, to date this discussion has been a great deal theoretical, and while several plants have been installed to operate to produce 1-grain moisture content, so far there have been no published results of actual operation of blast furnaces at 1 grain to prove the advantages, if any, of 1-grain moisture content over 3-grain.

The actual gains in production as shown by results from 3-grain systems in actual operation are considerably above any theoretical gains that can be calculated. The only explanation of this so far advanced is that, due to the uniformity of operation possible with uniform blast conditions because the last major variable in its operation has been eliminated, the furnace can be operated at its peak continuously. Hence, since the major gain of uniformity is already accomplished by use of a 3-grain system, many operators believe that the only possible additional gain by going to a 1-grain system is the insignificant theoretical gain that can be calculated between the two. None the less some furnaces desire a 1-grain system just in case events encourage going to that low level.

James Gayley, in 1904, conducted the first large-scale dry-blast experiments in the United States. He reduced the moisture from 5.66 grains to 1.75 grains per cub. ft., and he raised his iron output about 10 per cent. and dropped coke consumption about 12 per cent. His equipment, however, was costly and the scheme fell into disfavour. In 1939, Woodward put in modern and more efficient Carrier equipment, and immediately reported 10 per cent. or more gain in production, with additional advantages in less off-grade iron and constant, smooth furnace operation. Jones & Laughlin have been extremely laudatory as to the results obtained. There has, none the less, been perhaps a rather regrettable tendency in the industry to view these results as exceptions or almost as spurious. This viewpoint, however, is changing. Many in the industry are waiting for reports from the Bethlehem and Inland plant, and preliminary indications are that these will be sufficiently favourable to create a rush for dry-blast on anywhere from 20 to 50 additional stacks.

Utilisation of Blast-Furnace Gas.—Discussing the economic criteria in the utilisation of blast-furnace gas in boiler plant, C. MONTEIL says in "Revue de Métallurgie" that a variety of desiderata have to be met, *e.g.*, partial not complete cleaning of the gas, cooling to remove part of the moisture, heating of the combustion air, the use of suitable burners and appropriate grate design, if a high efficiency is to be attained. The gas can also be used successfully in steam turbines and blowers. In modern designs of gas engines, turbines and boilers, one of the chief aims is to reduce the gas consumption and the cost per kw.-hrs.

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IS CHARACTERISED by closeness of grain structure, uniformity of composition and fine graphitic carbon evenly distributed.

IS PRODUCED to guaranteed analysis in seven standard grades.

CAN BE MADE to customers' individual requirements with total carbon from 2·6 per cent. upwards.

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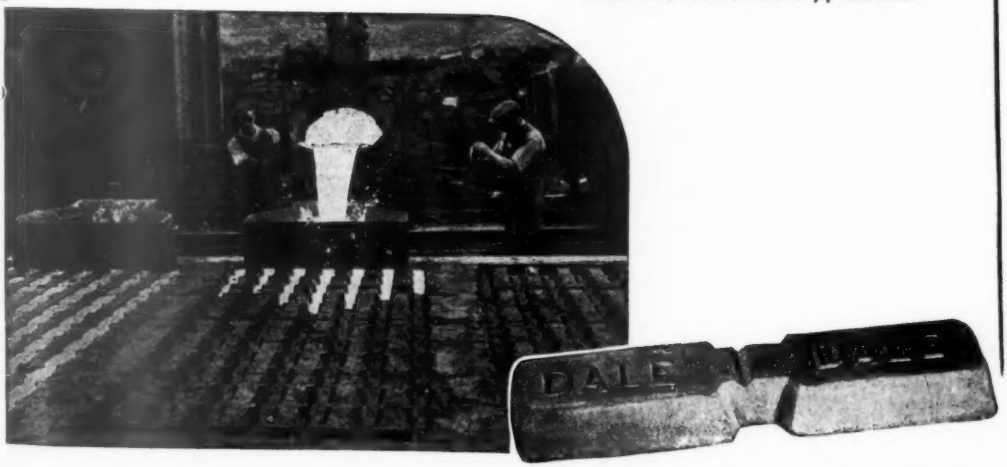
Users are invited to avail themselves of the Stanton Technical Service which offers free expert advice on special mixtures and other Foundry problems.



THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

TAXATION OF INDUSTRY

F.B.I. MEMORANDUM

A memorandum on taxation drawn up by the Federation of British Industries and submitted to the Chancellor of the Exchequer reviews the financial needs of industry now and in the post-war period, and submits that, to meet the situation, a major change in the law of taxation of business is required.

It is pointed out that industry, which will be faced with the task of providing employment on the widest possible scale, will require finance for rehabilitation for peacetime purposes and to enable it successfully to compete in the export market. As the nation may have to face after the war a long period of high taxation, industry may no longer be able to rely on outside sources for finance. The alternative for industry is to provide its own finance out of retained profits, a process that must be hampered by high rates of taxation.

Notwithstanding wartime reliefs, the position of many firms in industry after three years of war has steadily deteriorated. Essential working capital is being drawn away by taxation, especially as it affects concerns working on low or substituted standards. The Federation, therefore, submits that the retained profits of the business taxpayer should be granted some relief from taxation, subject to necessary safeguards. It is envisaged that machinery would be required to ensure that such surpluses should be subject to the full rate of taxation, if they were distributed at a later date. The Federation realises that in the past Parliament has set its face against permitting undistributed profits to escape taxation, but the submission is made in the belief that the drastically changed circumstances justify a review of the question.

Commercial Costs

The Federation also seeks taxation relief to industry by a new approach to those costs of production arising from the taxpayer's need to write off over their expected life all the assets employed in the business. In the past, in many cases, no allowance has been made for taxation purposes. The principle that assets used up in production or in trading should be written off over their life seems to the Federation one merely of plain justice to the taxpayer. It was inequitable that such allowances were not made when taxation rates were low. Now that the rates are high these disallowances are in effect a tax on capital. Particular reference is made to freehold buildings (not land), leasehold premises, the cost of patents, trade marks, designs, and the residual value of assets not replaced.

In addition to advocating these permanent reforms, the Federation points to the hardships inherent in the excess profits tax, intensified by the 100 per cent. rate, and regrets that the Government cannot see its way to reconsider the rate, more especially as the promised return of 20 per cent. can be only of contingent value.

In particular, the Federation submits that the hardship suffered by most concerns which have to work on a substituted standard should be mitigated by raising the "ceiling" by which the Board of Referees is limited to 8 per cent. of the capital employed (or if the directors control the company to 10 per cent.). This would correspond to the percentage allowed to new concerns or newly introduced capital.

In addition to the foregoing, which is argued in the memorandum in more detail, a number of smaller points have been put forward for discussion with the Chancellor's advisers.

HYDRO-ELECTRIC RESOURCES OF NORTH WALES

SIR H. MORRIS-JONES asked the Minister of Fuel and Power if he would set up a committee, on the lines of the Committee on Hydro-Electric Development in Scotland, to consider analogous development in North Wales.

MAJOR LLOYD GEORGE replied that the water-power resources of North Wales, which were very much smaller than those of the North of Scotland, formed the subject of an investigation in 1921 by the Water-Power Resources Committee of the Board of Trade. Since then, they had been substantially developed as part of a grid area scheme, which ensured that the electricity requirements of North Wales, so far as they could not be met from the water-power resources, were provided for from other sources of supply. In view of these developments, he could not agree that the undeveloped water-power resources of North Wales were great enough to warrant further investigation, at any rate at the present time.

MUSIC IN FACTORIES

In the Chancery Division of the High Court last week, Mr. Justice Bennett gave judgment for the plaintiffs in an action in which the Performing Right Society, Limited, claimed a declaration that the defendants, Gillette Industries, Limited, were not entitled to reproduce in their factory gramophone records or rediffuse music broadcast by the B.B.C. in the "Music While You Work" programmes without the leave or licence of the plaintiffs as owners of the performing rights in the music. The plaintiffs' claim was in respect of five musical works. His Lordship said that plaintiffs had established that their rights in the musical compositions in question had been infringed by the defendants. They did not ask for an injunction, but were content to have their rights declared. Accordingly, there would be a declaration that the performances by the defendants were "in public," and were infringements of the sole rights of performance in public owned by the plaintiffs. The defendants would pay the costs of the action.

MR. RICHARD HAZLETON, general secretary of the Institution of Production Engineers since 1929, died on January 26.

Add up the Lost Hours

HOW many wagons or lorries, or canal-boats have come to you in the last month for loading or unloading? How many unnecessary hours have they remained *standing still* at your wharf, your loading bay? For those hours they were no longer in the transport system. Could you have saved any of that time — got the vehicles on the move again a little sooner? Ten minutes saved in each hour of standstill time would give an immense impetus to our war transport all over the country. What can you do about it?

You know your own problems best. Tackle them in your own way. But tackle them now. Plan, encourage ideas, improvise if needs be. Here's a starting-off agenda:

1. CHECK OFFICE ARRANGEMENTS
2. LABOUR-SAVING EQUIPMENT
3. BLACK-OUT WORKING
4. OPINIONS OF "MEN WHO DO THE WORK"

WE MUST GET AN EVEN QUICKER TURNROUND

Ministry of War Transport

12

NEWS IN BRIEF

A BRITISH Internal Combustion Engine Research Association is to be formed.

THE HEAD OFFICES of the British Iron, Steel and Kindred Trades Association and the Iron and Steel Trades Confederation are now at Swinton House, 324, Gray's Inn Road, London, W.C.1.

THE COUNCIL of Foreign Bondholders, in its report for 1942, stresses the importance to this country in the post-war years of every possible step being taken to make good our foreign investment income.

THE BRITON FERRY STEEL COMPANY, Limited, held an extraordinary meeting last week to convert the issued 350,000 5 per cent. (tax free up to 5s.) cumulative preference and 290,150 ordinary shares of £1 into stock, transferable in multiples of £1.

AT A MEETING in Edinburgh last week of the Executive of the Scottish Council on Industry, it was reported that the Working Committee had considered problems affecting particular industries, and in the case of the light-castings industry, a sub-committee had been appointed to discuss with the industry the problems with which it was confronted, with a view to appropriate action being taken.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, Elecfurn Works, Watford By-Pass, Watford, announce that they have made an arrangement with Ferranti, Limited, of Hollinwood, Lancs, to collaborate in the development of high-frequency industrial heating equipment. This collaboration between the technical departments of the companies will, it is felt, enable more rapid advances to be made in the fields of metallurgical heat-treatments and kindred processes. The high-frequency generating equipment will be designed and manufactured by Ferranti, Limited, while the heating, handling and quenching equipment will be manufactured by Wild-Barfield Electric Furnaces, Limited. Sales and installations of the equipment of the two firms will be handled by Wild-Barfield Electric Furnaces, Limited, to whom all inquiries should be addressed.

SCOTTISH HYDRO-ELECTRIC DEVELOPMENT

The text of the Hydro-Electric Development (Scotland) Bill has now been issued. It gives effect to the main recommendations of the committee under the chairmanship of Lord Cooper which recently reported to the Government on hydro-electric development in Scotland. The development envisaged by the committee will have as a main object the attraction to the North of Scotland, through the offer of cheap and abundant electric power, of a share in the expanding electro-chemical and electro-metallurgical industries. The Bill makes provision for the establishment of a North of Scotland Hydro-Electric Board, and the Government propose that Parliament should authorise the Treasury to guarantee loans to the amount of £30,000,000 to be raised by the Board.

PERSONAL

MR. R. D. BURN has been appointed by the Minister of Supply to be a Deputy Controller in the Non-Ferrous Metals Control.

MR. CECIL BENTHAM, chairman of Henry Simon, Limited, Cheadle Heath, Manchester, has been appointed a Deputy Controller-General of Machine Tools in the Ministry of Supply.

MR. WM. FREDERICK GILBERTSON, of Brynglas, Bryncoch, near Neath, has been appointed an assistant general manager of Baldwins, Limited, at their South Wales branch, as from February 1.

MR. E. LESLIE WALLIS, who has just been made President of the National Federation of Building Trades Employers, is a member of the firm of G. E. Wallis & Sons, Limited, of Maidstone and London.

LORD CRAWFORD, chairman of the Wigan Coal & Iron Company, Limited, and a vice-chairman of the Lancashire Steel Corporation, Limited, has been elected an hon. associate of the Royal Institute of British Architects.

MR. D. LLOYD, manager of the Bowesfield Works of Dorman Long & Company, Limited, Middlesbrough, who recently retired after 50 years with the firm, has received a presentation from the staff and workmen at the company's Ayton Sheet Works, where he was formerly assistant works manager.

MAJOR ERNEST O. YATES, managing director of Thomas Smith & Sons of Saltley, Limited, drop forgers, has been elected president of the Birmingham, Wolverhampton and Stafford District Engineering and Allied Employers' Association. Major Yates is president of the Association of Drop Forgers and Stampers.

MR. ANTHONY GEORGE MALDON MICHELL, of Melbourne, has been awarded the James Watt Gold International Medal by the Institution of Mechanical Engineers. Mr. Michell, who is 73, is known particularly for his turbine-engine bearings. Mr. S. M. Bruce, High Commissioner for Australia, received the medal in London on behalf of Mr. Michell.

DR. F. J. NORTH, head of the Department of Geology at the National Museum of Wales, Cardiff, has been elected president of the South Wales Institute of Engineers. Dr. North, who succeeds Lieut.-Col. S. B. Haslam, president of the Institute for the past two years, was born in London in 1889, and obtained his D.Sc. degree in the University of London.

MR. F. SCOPES has been appointed a director of Stewarts and Lloyds, Limited. MR. WILLIAM STEWART has resigned the secretaryship of the company and of the subsidiary and associated companies, and MR. L. M. T. CASTLE has been appointed secretary in his place. Mr. William Stewart retains his seat on the board of the company and of subsidiary companies.

THE OFFICIAL COST-OF-LIVING index figure at January 1 was 99 points above the level of July, 1914, as compared with 100 points a month earlier. At September 1, 1939, the index was 55 per cent. above July, 1914.

How much of the Nation's fuel is being WASTED?

The advantages of Insulation include:—

- **Conservation of Fuel.**
- **Working Heat attained in less time.**
- **More Even Heat Distribution.**
- **Improved Control of Temperature.**

Efficient insulation can permit greater output — lower production costs — improved furnace control & operating conditions.

EVERY works — every citizen — is now in the front line in the battle for fuel. Heat losses are a burdensome waste which must be prevented wherever possible. The gravity of the situation demands that even the most essential war industries should rigidly conserve fuel. Wherever insulation is applicable an efficient system should be installed — without delay. The 'Amberlite' range of insulating bricks covers the requirements of every industry and large quantities are available from stock.

G.R. insulation specialists are ready to assist users in the choice of materials to meet particular conditions of service.

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WOLVERHAMPTON'S PRODUCTION EXCHANGE

A Production Exchange has been opened in Wolverhampton. The objects of the exchange are to maintain personal contacts between all firms, large and small, many of whom are overloaded, while others have capacity to spare. Such contact should result in maximum outputs.

Col. H. B. Sankey (Regional Controller) opened the exchange and described it as a bold and ambitious scheme. There was a large number of sub-contracts which he was sure could, and would, be placed through the exchange far more quickly and with better results for all concerned than by any other means. To ensure success it must have the backing of all firms.

A committee was formed consisting of the following:—Acting chairman, member of Production Committee, Mr. A. Dyson (Horseley Bridge & Thos. Piggott, Limited, Tipton); Mr. W. E. Bullock (Guys, Wolverhampton); Mr. A. G. B. Owen (Rubery Owen & Company, Limited, Darlaston); Mr. C. W. Parkes (Josiah Parkes & Sons, Willenhall); Mr. F. J. Plant (Stewarts and Lloyds, Limited, Halesowen); Mr. B. M. Sixsmith (Chatwood Safe Company, Shrewsbury); Mr. H. Skidmore (Clydesdale Stamping Company, Netherton); Mr. R. Weddell (W. G. Allen & Sons, Tipton); and Mr. V. J. West.

The exchange is to be open each Tuesday from 2 to 5.30 p.m., when representatives of the Committee will be available.

CONTRACTS OPEN

The date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Crompton, February 15—Castings, etc., during the 12 months commencing April 1, for the Urban District Council. The Acting Engineer and Surveyor, Town Hall, Shaw, Lancs.

Littleborough, February 15—Iron castings, tools, etc., during the year ending March 31, 1944, for the Urban District Council. Mr. G. F. Wild, engineer and surveyor, Council Offices, Littleborough, Lancs.

Oswaldtwistle, February 13—Cast-iron pipes and special castings; stop taps and ferrules; brass fittings, etc., for 12 months from April 1, for the Urban District Council. The Surveyor, Town Hall, Oswaldtwistle.

Runcorn, February 10—Iron castings for 12 months, for the Urban District Council. Mr. A. B. Cunningham, engineer and surveyor, Town Hall, Runcorn.

MR. FRED A. SMITH, general secretary of the Amalgamated Engineering Union since 1933, died on Saturday, January 23, as he was about to leave hospital at Northampton, where he had had a leg amputated. He would have been 56 next month.

COMPANY NEWS

(Figures for previous year in brackets.)

William Baird & Company—Interim dividend of 4% (same).

Burnell & Company—Net profit, £28,917 (£29,416); dividend of 15% (same).

Weyburn Engineering Company—Final dividend of 22½%, plus a bonus of 5%, making 35% (same).

R. A. Lister & Company—Final dividend of 5% and a bonus of 6% on the ordinary shares, making 16% (same).

Industrial Plant—Profit to November 30 last, after taxation, £552 (£554); dividend of 5% (same); forward, £517 (£501).

Hammond Lane Foundry—Profit for 1942, £15,050; final dividend of 7% (same), plus a bonus of 2½% (nil), making 12½% (10%); to reserve, £4,000 (£3,300); forward, £4,248 (£3,305).

Bertrams—Net profit for the year ended September 30 last, £8,526; reserve for improvements, additions and replacements, £3,000; employees' fund, £2,000; dividend of 10%, £2,250; forward, £2,907 (£1,630).

William Asquith—Profit for the year to August 13, 1942, £132,934 (£115,019); taxation and contingencies, £110,000 (£104,000); ordinary dividend of 5% (same); to general reserve, £20,000 (nil); forward, £23,419 (£30,206).

J. & E. Hall—Net profit for the year ended September 30 last, £84,429 (£72,911), after making provision for E.P.T., £100,000 (£30,000), and before charging for income tax, £27,000 (same); ordinary dividend of 10% (8½%); forward, £49,067 (£43,639).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

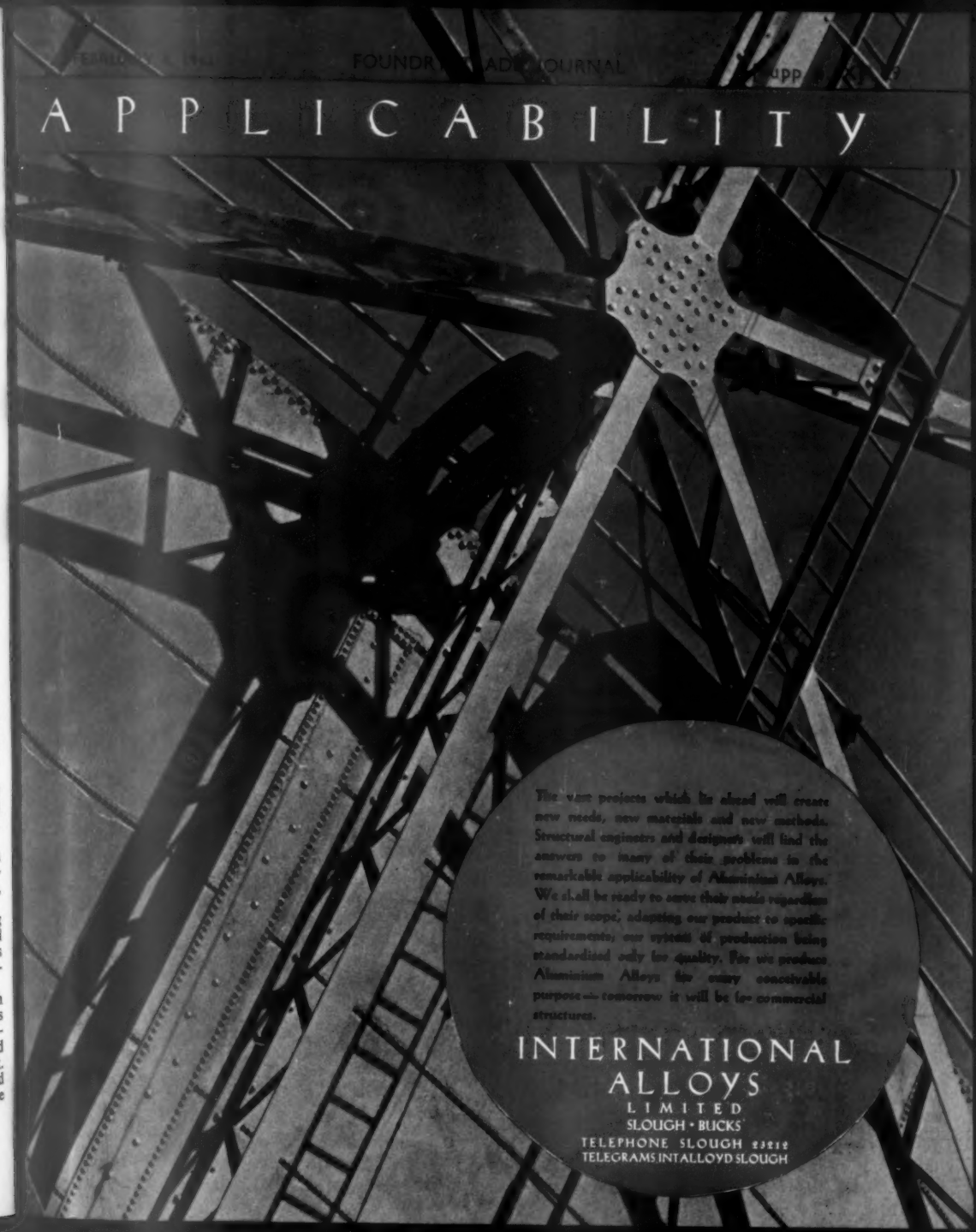
John F. Hall, 6A, Horninglow Street, Burton-on-Trent—Engineers, tool makers, etc. £3,150. J. F. and P. S. Hall.

Jones Bros. & Company (Leytonstone), 177, Cathall Road, Leyton, London, E.11—Engineers, metal and alloy makers, etc. £5,000. S. H. Jones and D. F. Grearson.

T. W. Palmer & Company (Merton Abbey), Merton Abbey Ironworks, Church Road, London, S.W.19—Constructional engineers. £75,000. G. S. Alderman, W. E. F. Palmer, and C. A. Botting.

Sturla's Bronze Foundry, 40, Avenue Lane, Canning Town, London, E.16—To take over the business carried on at 171, High Street, Waltham Cross, as "Sturla's Bronze Foundry." £2,000. S. R. Russell, D. M. Dickson, T. Brewitt, and F. Godwin.

Metters, Bank House, High Street, Rickmansworth (company incorporated outside Great Britain which has established a place of business within Great Britain)—Registered in South Australia, July 7, 1937. Formed to take over the business formerly carried on by Fdk. Metters and Henry L. Spring at Sydney, Adelaide and Perth, as "Fred Metters & Company," to carry on the business of ironfounders, etc. £100,000.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